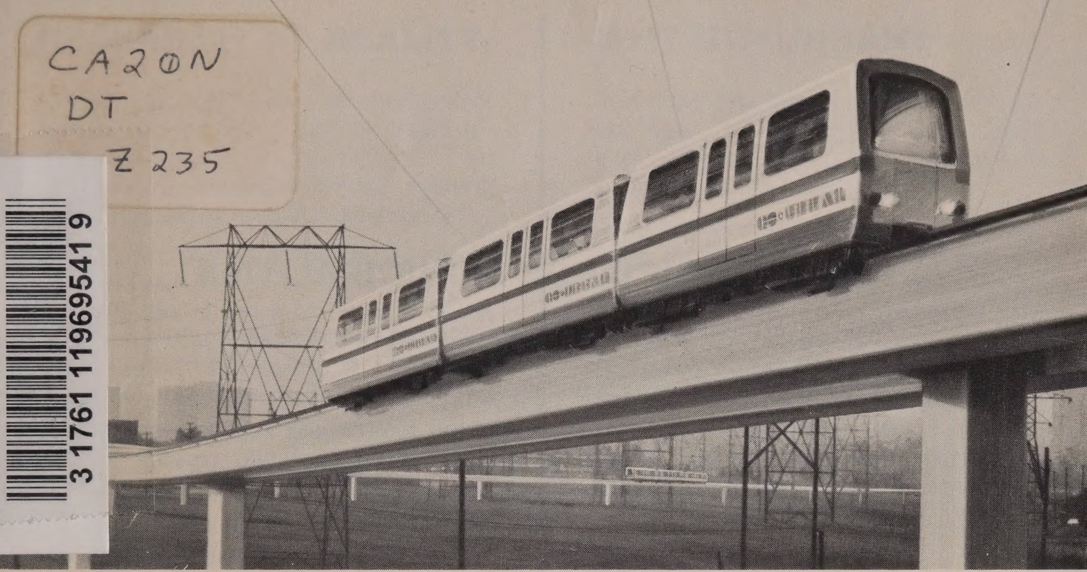


GO-URBAN

A GOVERNMENT OF ONTARIO PROJECT

Ontario

Ministry of Transportation and Communications

Hon. William G. Davis, Q.C.	Hon. Gordon Carton, Q.C.	A.T.C. McNab
Premier	Minister	Deputy Minister

A NEW CHOICE FOR MUNICIPALITIES

GO•URBAN, the new intermediate capacity transit system under development by the Government of Ontario, is one of the most exciting advances in transportation in recent years.

The announcement of the choice of the system and subsequent developments have caught the attention of transportation experts not only in Ontario and in Canada, but in other nations with problems similar to ours.

I believe that in GO•URBAN the government has one of the tools necessary to build modern transportation systems in our large urban areas to preserve the character of neighborhoods and provide the quality of life that our citizens seek.

Bill Davis

William G. Davis
Premier

RESEARCH TO REALITY

On May 1, 1973, the Government of Ontario signed a contract for construction of a demonstration project of an intermediate capacity transit system, turning years of research into reality.

New modes of transportation have been watched with interest over the years, but in 1969 the Ministry of Transportation and Communications of Ontario began an intensive survey of intermediate capacity transit systems around the world.

Scores of systems were studied and evaluated and by 1972 eight companies were invited to submit proposals to the Ministry.

By late 1972, five of the proposals had been eliminated. Of the three remaining, Ford Motor Co. of the United States withdrew for corporate reasons, leaving Hawker-Siddeley of Canada Limited of Toronto and Krauss-Maffei A.G. of Munich, Germany.

With provincial commitment to the building of a prototype demonstration system, the two companies submitted detailed technical and cost proposals for evaluation by the Ministry.

After three months of intensive analysis of the two proposals, the acceptance of the Krauss-Maffei system was recommended to the Government of Ontario.

WHY GO•URBAN?

In announcing the choice of developer on May 1, Premier William Davis explained the need for intermediate capacity transit capability:

"The decision last November to underwrite the cost of a prototype demonstration project for an intermediate capacity transit system recognized the pressing need for a public transit system having a capacity between that of a subway and a conventional bus system; one that would move people in urban areas without increasing the already excessive stresses on roadways or disrupting the community environment."

Behind that statement were the hard facts known to all public transit authorities: subways with a capacity of 40,000 persons per hour cost $40 million a mile and because of the high capacity-high cost were only appropriate in areas of dense population. Other modes also had disadvantages: streetcars with a capacity of from 12,000 to 15,000 persons per hour were subject to traffic tieups; buses under ideal conditions could carry only 6,000 persons per hour.

And there were other limitations. Subway construction, whether by tunnelling or cut-and-fill methods, affects the surrounding community; streetcars with their steel-on-steel system are noisy and

largely unsuitable for residential areas; diesel buses give off pollutants, which multiply with the number of buses added to a system.

What was needed then was a system with a capacity ranging up to 20,000 persons per hour, with costs within the reach of large urban municipalities and capable of fast, high quality service.

Too often in the past, transit authorities matched a transit system to the needs of a neighborhood: subways for areas of dense population and buses or street-cars for areas of low density.

But with GO•URBAN, less densely populated areas will receive the same quality of service that subways had given the densely populated areas, but without disturbing the character of the neighborhood.

Also, subway systems have tended to promote high-density residential patterns as the public packed into the walking-distance corridors along the subway lines.

In the future, a person will be able to maintain the type of community life he desires with high quality transit service through GO•URBAN.

WHAT IS GO•URBAN?

GO•URBAN is a complete transit system in the primary stages of an evolutionary process. In other words, GO•URBAN will change or evolve as research and development add new dimensions to the base system.

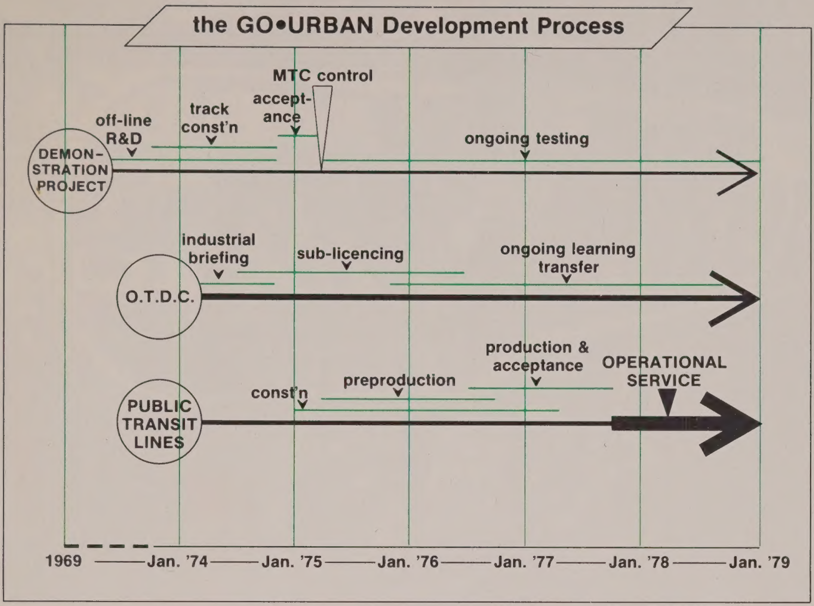
To test this base system supplied by Krauss-Maffei, a Transit Demonstration System is being built at the Canadian National Exhibition. The Transit Demonstration System (TDS) will expose the technology to all manner of environmental and physical demands, for the system must be fully adapted to Ontario's requirements.

On these tests will be based the design and development of Operational Revenue Systems (ORS) for application in Ontario's larger municipalities. The ORS, then, will be the second generation of the system.

Further research and development will be undertaken at the C.N.E. and by the newly created Ontario Transportation Development Corporation to produce subsequent generations of the system.

During the next decade, changes will build on change and it is quite possible that the GO•URBAN system of 1990 will bear little resemblance to the TDS at the Canadian National Exhibition.

The timing and the steps in this evolutionary process can be seen on the accompanying chart:



Following is a description of the vehicle, guideway and technology for the Transit Demonstration System at the Canadian National Exhibition.

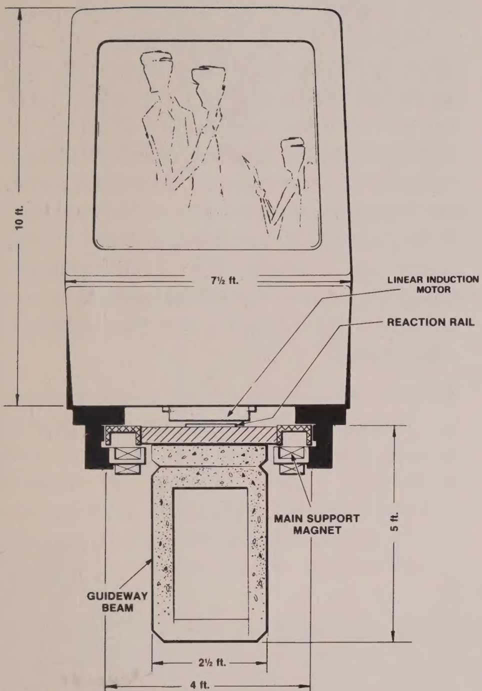
The vehicle

Each vehicle will hold 20 passengers, 12 sitting and eight standing. The seats are designed to provide armchair comfort and those standing will have ample room. The vehicle will be made of aluminum, 7½ feet wide, 20 feet long and 10 feet high. It will have a pair of doors on each side and emergency exits at the front and rear.

The vehicle is designed to run without an operator aboard. For the Transit Demonstration System, 15 vehicles will be used, but on the Operational Revenue Lines, up to 50 per mile may be used. The vehicles may operate singly or be formed into trains of three on The Transit Demonstration System or six on Operational Revenue Lines.

The guideway

While the demonstration project at the C.N.E. will be elevated, the GO•URBAN guideway can also be built at ground level or underground. The guideway consists of precast box-beams on slender columns. Elevations of the Transit Demonstration System guideway will range in height from 10 to 30 feet, measured from existing ground level to the top of the guideway. The box-beam will be 2 feet 5½ inches wide and five feet deep. It will rest on columns that measure 2 feet 5½ inches by 2 feet at the top, flaring to a maximum width of 5 feet by 2 feet at the base on a maximum column height of 25 feet. These columns will be approximately 90 feet apart, except on curves and at switching points where columns in pairs will be used. On the boxbeam will be reaction rail, armature rails and power rail. This assembly will be approximately 4 feet wide. Although The Transit Demonstration System is single track with off-line stations, the Operational Revenue Lines will be double track with off-line stations.



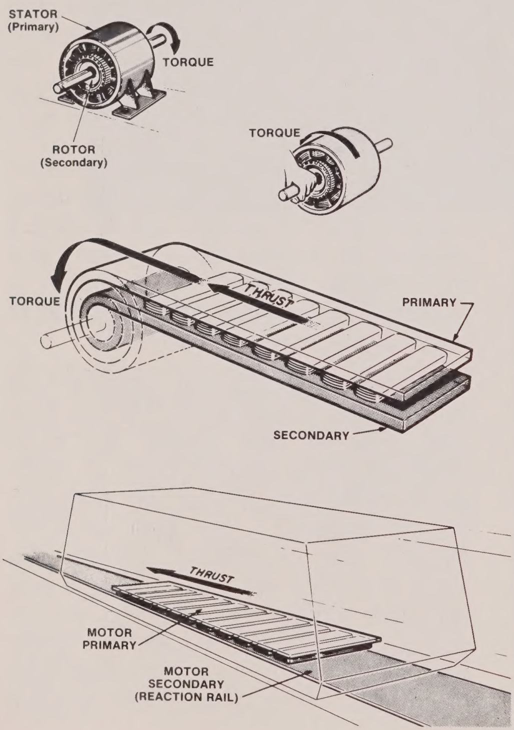
Technology

Propulsion for the vehicles is by Linear Induction Motors, used in a wide variety of applications in the past 15 or 20 years. LIMs designed specifically to propel transit vehicles have been developed mostly within the last decade and test vehicles using these motors are in operation in France, Germany, Britain and the United States. The 200 horsepower LIM is made up of two components, the aluminum faced iron secondary rail fixed to the guideway, and the vehicle-mounted wound primary. The motor is often described as the same as in a conventional motor, but sliced to the middle and stretched flat.

The LIM will be fed from a 600-volt direct current line, converted to alternating current, with the primary speed control attained by varying the frequency and the voltage. Braking of a vehicle is achieved by reversing the direction of the flow of current to the LIM.

A backup mechanical, caliper-type braking unit is also used. The vehicles are levitated and guided by eight magnets positioned in pairs at each corner of the vehicle. As power is applied to the magnets, they are attracted toward the guiderails, causing the vehicle to lift. They also provide lateral guidance through the same attraction to the guiderail. Tests indicate that under normal conditions, the magnets will hold the vehicle stable, comparable to a ride

in a full-size automobile on a good quality freeway. Controlling the magnets is a system of distance sensors and accelerometers. One vertical and one lateral sensor are used at each corner of the vehicle to measure the position of that corner in relation to the guiderail. The vehicle computer takes the eight signals and computes the position of the vehicle. Any displacement from the nominal position sends more or less current to the magnet concerned and the position is corrected.



Acceleromaters are placed at the four corners of the vehicle and at the front and the rear to measure the rate of change of motion. As a result, the vehicle will ride about two-thirds of an inch above the guiderails, with a horizontal clearance of about two inches. GO•URBAN will be entirely computer controlled. Three computers will be used, two to operate the system, the third for increased reliability. Computations of two of the three computers must agree or the system is shut down. Position measuring devices will be located along the guideway to warn the control system of any vehicular delaying activity. In the event of trouble, the system automatically reacts by either reducing the speed of the following vehicles or stopping them.

Safety precautions on the entire system are elaborate. In the event of a power failure, the vehicles will settle to the guiderails, using slides or rollers mounted on the underside. Emergency stop buttons and exits will be provided on the vehicles for evacuation into adjacent cars or on to the guideway. Diesel-powered retrieval vehicles will be able to tow disabled vehicles to the nearest station. Passengers will also have voice communication with Central Control if

necessary. Since the system is designed to be fully automated, personnel in a central location will monitor each station through remote control television cameras.

The combination of the Linear Induction Motor and magnetic suspension and guidance will produce an almost noiseless vehicle: noise level at 25 feet will be approximately equivalent to normal conversation at three feet.

The GO•URBAN System will be five times as efficient as the private automobile in the use of increasingly scarce energy resources. Stations, too, will be automated. In an Operational Revenue System, passengers probably will buy tickets in the stations from automatic dispensing machines. The tickets will then be punched as the passenger steps through the turnstile. When the train stops at a station, it will automatically activate its doors and the station doors on the platform, which resemble elevator doors in appearance and operation.

WHERE WILL GO•URBAN BE BUILT?

The Transit Demonstration System is now under construction at the Canadian National Exhibition. The $16 million test facility will continue to be used for experimental and research work until about 1980, refining and perfecting the entire system.

Use of the GO•URBAN system has been proposed for the three large urban areas of Ontario: Metropolitan Toronto, Ottawa and Hamilton. The proposed routes total 84.8 miles: 56.1 miles for Metropolitan Toronto, 11.4 miles for Ottawa and 17.3 miles for Hamilton.

The first Operational Revenue Line could be constructed in Northeast Scarborough as the result of a feasibility study now being carried out by the Metropolitan Toronto Planning Board. The two-year study will seek to recommend a route acceptable to those living and working in the area and consistent with long-term planning objectives both by the municipality and the Toronto Transit Commission.

With acceptance of the recommended route, the line could be in full operation by late 1978. This date, of course, is conditional on a number of factors, among which one of the most significant is the necessary information from the Transit Demonstration Project. Municipal co-operation is also an essential factor in implementation since it will be the local municipality that will be responsible for building, operating and maintaining the systems, which will be eligible for provincial subsidies — 75 per cent on capital costs and 50 per cent on operating deficit.

While the GO•URBAN system is initially proposed for Toronto, Hamilton and Ottawa, it could be applied, perhaps in a simplified form, in other cities where there is a demonstrated need.

WHO'S WHO IN GO•URBAN

The Government of Ontario signed a contract with Krauss-Maffei A.G. of Munich to be the developer of the Transit Demonstration Project at the Canadian National Exhibition.

Principal Canadian subcontractor from Krauss-Maffei is Canada Systems Group Ltd. of Mississauga, Ontario, a computer services company jointly owned by T. Eaton Co. Ltd., Steel Company of Canada Ltd. and T.R.W. of Cleveland, Ohio.

Canada Systems has the responsibility for both the design and construction of the entire infra-structure, namely, the guideway, stations, maintenance facilities, and the power distribution system.

Canada Systems has, in turn, awarded the design of the guideway, stations and maintenance facilities to McCormick Rankin & Associates Ltd. of Port Credit, Ontario. This firm has a long record of civil engineering experience.

McCormick Rankin has retained the services of the firm of Donald E. Skinner, Architect, of Port Credit, to design the stations.

Canada Systems has secured the services of H.H. Angus & Associates, consulting engineers, of Toronto to design the power distribution systems.

ADDITIONAL BENEFITS

An outgrowth of the contract signed with Krauss-Maffei, is the formation of the Ontario Transportation Development Corporation, which will undertake a continuing program of research and development of transportation systems and units.

In the contract, Ontario asked for and received the rights and licences to the Krauss-Maffei system, in recognition of its participation in the building of the Transit Demonstration Project at the Canadian National Exhibition. The Government of Ontario has exclusive rights in Canada, rights in South and Central America and other nations outside the European Common Market. In addition, the Government of Ontario receives a 10 per cent royalty from all income for systems sold by Krauss-Maffei in the United States.

With worldwide interest growing rapidly, it was decided to place these rights and licences in a corporation, which would not only research and develop transportation systems and units, but would also market the GO•URBAN system in Canada and other nations in which it has rights.

Income derived from the licences and rights and from direct sales by the corporation will be channelled into further research and development.

An equally important role of the new corporation is the fostering of Canadian industrial activity among present transit suppliers and by other industries that could produce subcomponents for the new technology.

The movement of industrial activity into innovative and sophisticated transit technology is expected to result in increases in employment and wage income.

The application of GO•URBAN in Ontario alone would result in an investment of $1.3 billion over 10 years, which would produce direct and indirect manpower requirements of about 60,000 man-years. The greatest impact would be on the electrical industrial equipment industry (20,000 man-years), with the construction, maintenance and repair sector holding second place with 12,000 man-years.

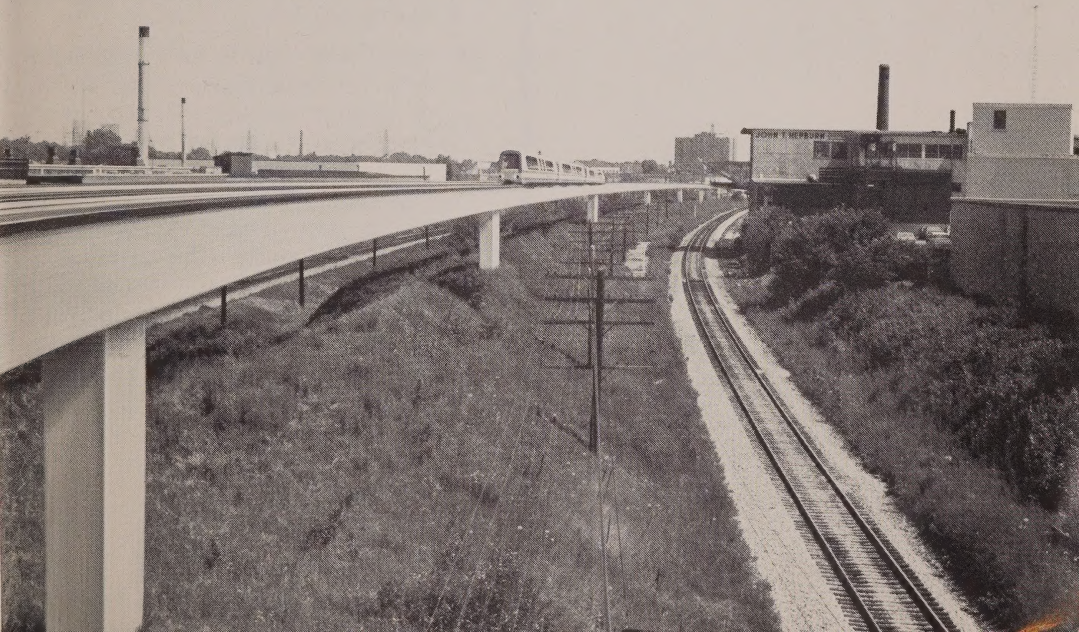
In other words, over the 10 year period, employment requirements would be

6,000 man-years of work. Much of this work is of the high technology variety; here the spin-off benefits into other areas of development will be significant.

Estimates of the Canadian market for the GO•URBAN system range from $2.8 billion to $3.5 billion. Using the more conservative figure, an estimated 141,000 man-years of labour would be required over a 10-year investment period. Again the electrical and communications industry would benefit the most, followed by the construction, maintenance and repair industry.

Cities in Canada in which the GO•URBAN system could find application include Vancouver, Edmonton, Calgary, Winnipeg, Montreal and Quebec City.

In foreign markets, a few urban centers can be identified as prime potential markets for the GO•URBAN system. Included in this group are Sao Paulo, Buenos Aires, Rio de Janeiro, Caracas, Mexico City, Sydney and Melbourne, Australia. Total sales to these cities could range from a low of $2.5 billion to $3.7 billion.



YOU WERE ASKING

Q. Why build such a large demonstration project?

A. To be of value, the Transit Demonstration System must be true scale and incorporate as many features of a typical Operational Revenue Line as possible. This includes grades, sharp turns, different station types and the ability to operate at speed both on the straight and through a curve. Also, the system should be able to operate under realistic and varying degrees of passenger load conditions.

Q. Why build the demonstration system at the C.N.E.?

A. The C.N.E. site is an environment which provides exposure to a variety of atmospheric conditions including winds, moisture, freezing rain from Lake Ontario and salt spray from the Gardiner Expressway, which are needed to determine system reliability. The demonstration at the C.N.E. will not interfere with any residential areas and yet it draws a large number of people who can provide a true passenger/system test.

Q. What Canadian or Ontario content will go into the demonstration system?

A. There will be 70 per cent Canadian content.

Q. How can small 20-passenger vehicles carry 20,000 passengers per hour per direction?

A. The cars will be coupled into six car trains on an Operational Revenue Line. These trains will operate on 20-second intervals on mainline, thus:
6 x 20 = 120 per train
120 x 3 = 360 per minute
360 x 60 = 21,600 per hour

Q. How does the Transit Demonstration System differ from others operating around the world, i.e., at Disneyland or in Japan?

A. No other operating system uses small vehicles able to operate singly or in trains, with Linear Induction Motors or Magnetic Suspension. No other system has as sophisticated a control system although there are several automated systems in operation.

Q. Who will operate the demonstration system?

A. The Ministry of Transportation and Communications will operate the demonstration system. This may take the form of a contract with the developer who would maintain and operate the system for the Ministry.

Q. Will the demonstration system remain and become a permanent part of the C.N.E.?

A. Metropolitan Toronto has the option after 1979 of retaining the system at the C.N.E. as built, or hooking that system into its transportation system through a line to Union Station.

GO · A NEW WAY

Ontario's new Urban Transportation Program.
Ministry of Transportation and Communications.